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# (12) UK Patent Application (19) GB (11) 2 225 229 (13) A

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(56) Documents cited

GB 2181048 A

GB 1310373 A

GB 1265480 A

GB 1093320 A

GB 1078656 A

GB 1046049 A

GB 1035073 A

WO 84/02260 A1

US 4686725 A

(58) Field of search

UK CL (Edition J) A4M

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## (54) Mattress assembly

(57) To provide a sufficiently firm substrate for a child to stand upon, a relatively stiff support layer (10) consisting of a sheet of closed cell non-porous foamed material is located beneath a relatively soft mattress layer proper (20) of air permeable foamed material. To enable air circulation and drainage of fluids (to avoid suffocation or infection, respectively) the mattress proper (20) is permeable, while the support layer (10) has apertures (16) therethrough, which preferably lead into intersecting grooves (12, 14) in at least one major surface of said support layer.

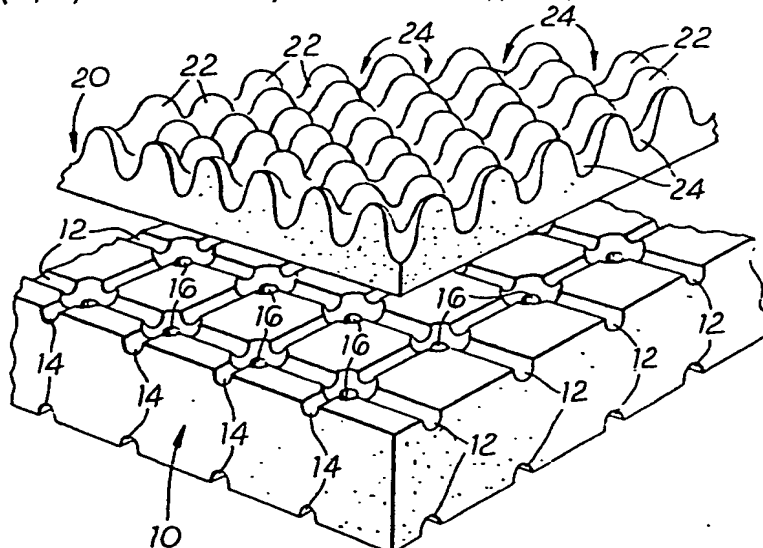


Fig. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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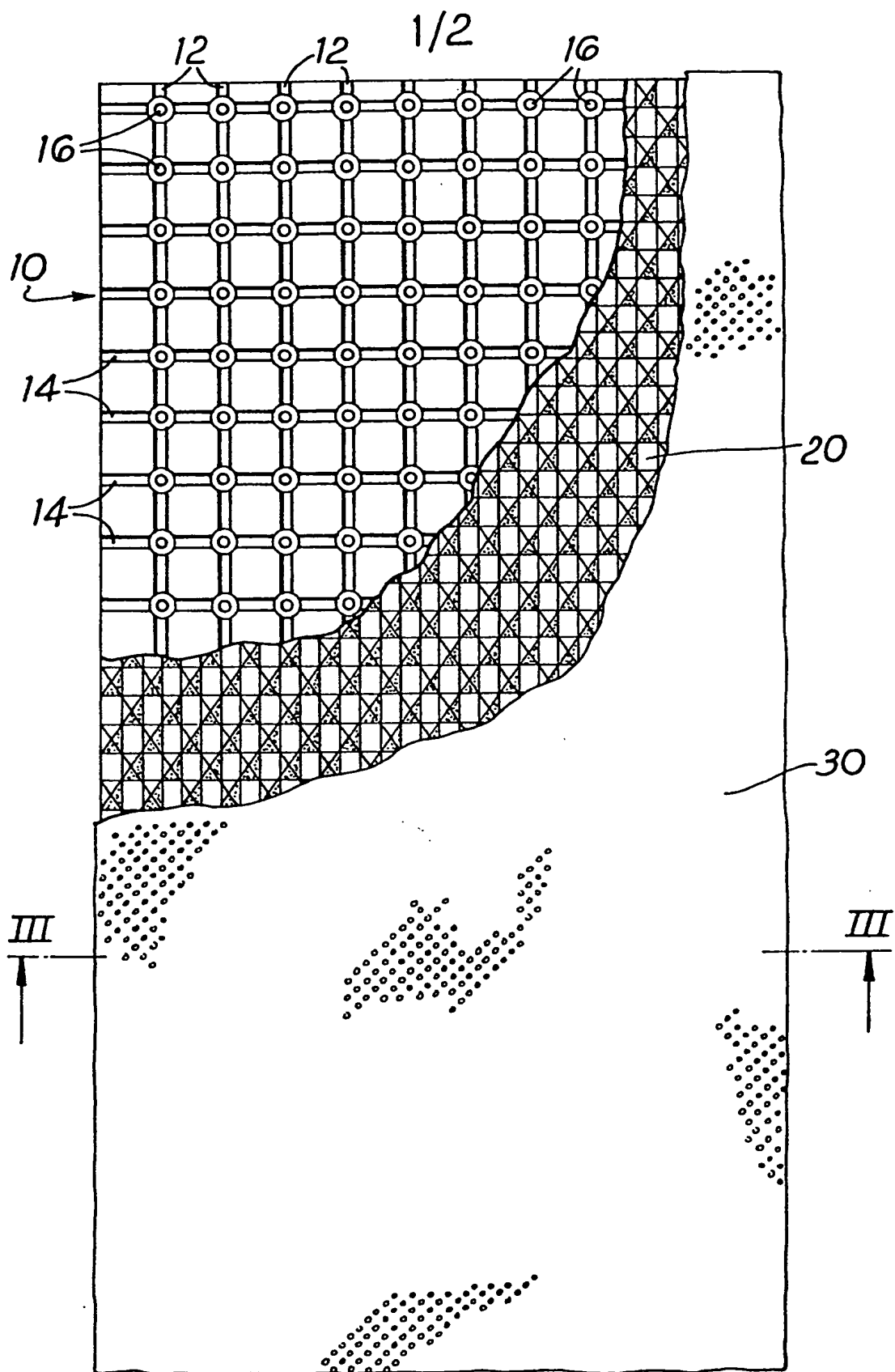


Fig.1

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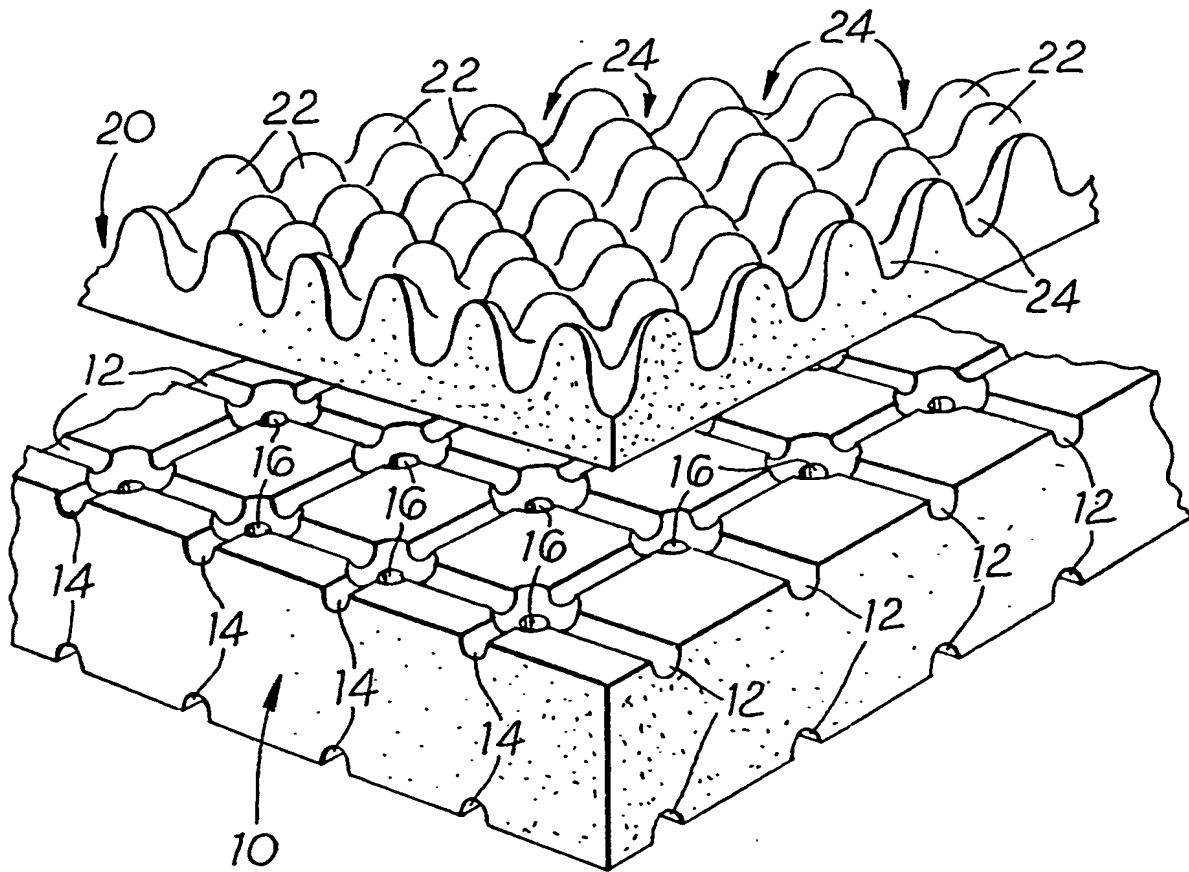


Fig. 2

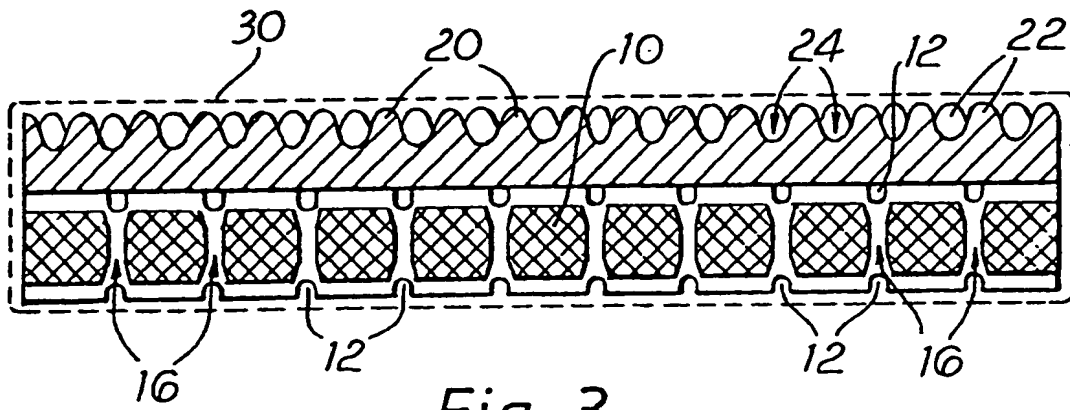


Fig. 3

MATTRESS ASSEMBLY

This invention concerns a mattress assembly which is specifically designed for children, but could also advantageously be used by adults, particularly the aged and infirm.

In the design of mattresses for children, in addition to the standard requirements for all mattresses, that they should be sufficiently soft for comfort, yet at the same time sufficiently firm to give support to the recumbent body (and also be fire-retarding), there are the additional requirements:

- (i) that they should be capable of allowing air to circulate or penetrate to avoid suffocation of the child when lying face down;
- (ii) that they should be permeable to liquids so as to permit drainage of urine or spillages, and
- (iii) that they should be capable of being washed quickly and effectively for purposes of hygiene.

Foamed rubber and foamed plastics mattresses are well known, but without apertures therethrough and/or specially contoured, corrugated major surfaces, as

disclosed in the inventor's earlier U.K. Patents Nos. 1078656 and 1310373, it is doubtful whether they are sufficiently permeable to rule out suffocation. Furthermore, when they overlie impermeable plastics sheeting, as is often the case, their breathability is limited and their drainage properties are negated in that waste products are retained within the thickness of the mattress material causing a health risk. These problems are much more severe if plastics sheeting is placed on top of the mattress to avoid the need for too frequent cleaning of the mattress.

As mentioned, the aforesaid hazards are avoided by using readily washable mattresses provided with apertures and/or corrugated major surfaces. However, with the conventionally used foamed rubber and foamed plastics a further problem arises in that the mattress does not provide a sufficiently firm substrate for a child to stand upon. It will be appreciated, in this respect that children between the ages of, say, 1 and 4 years, frequently stand upon their mattresses within their cots for prolonged periods. It is believed that this is not conducive to well-aligned hip and leg development in these formative years.

More generally, such foam mattresses tend rapidly to develop a hollow when repeatedly lain upon and they

do not really provide a sufficiently firm sleeping posture support for either an infant or an adult such that back ache or other back problems may result from prolonged usage.

It is, therefore, an object of the present invention to provide a mattress assembly which provides, overall, much firmer support than hitherto, and which enables a child to stand thereon for prolonged periods without the risk of impairing limb development, yet still has all the other desired characteristics mentioned above.

Pursuant hereto, the invention provides a mattress assembly comprising a relatively soft mattress layer proper resting upon a relatively stiff lower support layer, the mattress layer consisting of a sheet of air permeable foamed material, and the support layer consisting of a sheet of closed cell, non-porous foamed material having apertures therethrough.

It will be appreciated that the support layer provides the necessary firm underlying support for the softer conventional mattress proper.

To facilitate air circulation through the assembly, the support layer preferably has a plurality of grooves

traversing at least one of its major surface, with the apertures leading into these grooves. Advantageously, both major surfaces of the support layer have an intersecting arrangement of grooves formed therein, with the apertures extending between aligned intersection points of the grooves in the respective surfaces.

The foamed nature of the support layer makes it light in weight, and thus easy to manoeuvre and transport and suitable for use in prams and carrycots. The fact that it is closed cell makes it non-absorbent so that it does not tend to retain any waste fluids draining through the apertures, which could otherwise lead to the risk of infection. Moreover, this makes it particularly easy to wash and disinfect the outer surfaces thereof.

Expanded foam polyolefins, either cross-linked or non-cross-linked, are particularly suitable materials for the support layer as they possess all the required properties just mentioned. Moreover, they are relatively chemically inert, and not readily crumbled or broken away by prolonged wear. Polyethylene, polyurethane or polyvinyl chloride (PVC) at a density in the range of 20 to 40 Kg/m<sup>3</sup>, preferably 25 to 35 Kg/m<sup>3</sup> has been found to be very satisfactory. However, other materials may be found to be adequate alternatives.



The support layer and the mattress layer, which may be an ordinary sheet of foamed plastics, or may have at least one contoured surface with peaks and hollows as disclosed in UK specification 1078656, are intended for use together and are advantageously supplied and used within a permeable cover, rather like a pillow case. Such a cover may advantageously be made of open-mesh fabrics, e.g. open weave textile fabric, again to facilitate air circulation and fluid drainage.

However, as the support layer could be supplied separately for use with a conventional foam mattress proper, a further aspect of the invention is the mattress support, alone, comprising a sheet of closed cell, non-porous foamed material having opposing major surfaces, a plurality of grooves traversing at least one of these major surfaces, and apertures connecting the major surfaces and leading into the grooves.

The invention will be described further, by way of example, by reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a preferred embodiment of the mattress assembly of the invention, which is successively broken away from the top left to reveal the components thereof;

Fig. 2 is a fragmentary perspective view, to an enlarged scale, of the mattress layer and support layer only of the Fig. 1 embodiment; and

Fig. 3 is a transverse cross-section along the line III-III in Fig. 1.

As illustrated, a preferred mattress assembly, as intended for use on a child's cot, comprises a relatively stiff support layer, in the form of a rectangular sheet 10 of expanded foamed polyethylene, and a relatively soft mattress layer proper, in the form of a rectangular sheet 20 of foamed plastics of substantially equal dimensions, the two sheets 10, 20 being arranged one on top of the other inside an envelope or cover 30 of open weave textile fabric. Obviously, in use, the mattress layer 20 must be uppermost and rest upon the support layer 10.

Suitable dimensions for the assembly are 100cm x 20cm. However, any shape or size can be produced to suit the intended use. For example, the respective sheets 10, 20 will be smaller for a pram and can be oval or oblong if appropriate. In most cases, the mattress layer proper 20 is about half the thickness of the support layer 10. For example in the illustrated embodiment, for use in a cot, the mattress layer is about 4cm thick and the support layer 8cm thick. These

thicknesses may well be halved in a corresponding mattress assembly for a pram, the mattress layer 20 then being about 2cm thick only and the support layer 10, 4cm thick.

In the illustrated embodiment (see Figs. 2 and 3), the major surface of the mattress layer 20 remote from the support layer 10 is provided with peaks 22 and hollows 24, the peaks 22 extending above and the hollows 24 extending below the notional level of the surface. These peaks 22 and hollows 24 are arranged in staggered rows so that air should always be able to circulate around the peaks 22, through the hollows 24, even when a body is lying thereon. This minimises the risk of suffocation and is a known configuration.

The mattress layer 20 is, in fact, fairly conventional and need not be described in great detail. It is made, as mentioned, of foamed plastics, e.g. foamed polyester or polyurethane. It is very light in weight, relatively much softer than the support layer 10, and permeable to air and liquids. To conform with current safety standards, of course, it should also be flame retardant or "combustion-modified".

The support layer 10, which may also be termed a mattress support, is, as mentioned, both thicker than

and stiffer than the mattress proper 20 and is made of expanded foamed polyethylene, which is also flame-retardant or "combustion modified". Except for special therapeutic purposes for back pain sufferers, the material of which it is made would not normally be considered sufficiently comfortable for use as a mattress in its own right. It is, of course, extremely firm. It has a closed cell structure, and is waterproof (or water repellent), so will not hold water and is not, in itself, permeable to liquids. It has a density in the region of 25 to 35 Kg/m<sup>3</sup> and would, therefore, float if placed in water.

It is extremely easy to clean the exposed surfaces of this sheet 10, simply by washing and drying same. Furthermore it is chemically fairly inert so detergent can be used and it can be wiped with disinfectants. It does not disintegrate, crumble, or break readily upon wear or application of normally encountered substances.

As illustrated, each of the two opposing major surfaces of the support sheet 10 are traversed by a series of parallel longitudinal grooves 12 and intersecting parallel widthwise grooves 14. The longitudinal grooves 12 are spaced about 5cm from each other. Similarly the widthwise grooves 14 are spaced about 5cm apart from each other, so that a regular grid

pattern results. All the grooves are generally U-shaped in profile and are approximately 1.25cm wide and 1.25cm deep. It should perhaps be emphasised that the grooves 12, 14 extend right to the edges of the sheet 10 on each side.

The grooves 12, 14 on each of the two opposing major surfaces of the mattress support 10 are aligned and apertures 16 are provided between the respective groove intersection points. The apertures 16 are thus evenly and regularly distributed throughout the mattress support 10 and serve to connect the two sides in such a way that air can readily circulate along the grooves 12, 14 and through the body of the support 10 via said apertures 16. Liquids can similarly drain away through the support 10 via the intersecting grooves 12, 14 and the apertures 16.

The grooves 12, 14 and apertures 16 may conveniently be formed by high speed routing or milling followed by drilling. Alternatively, thermal cutting or any other suitable method may be employed.

The cover 30 is closed on three sides by stitched seams or by folds in the fabric and the fourth side, through which the two sheets, mattress and support 20, 10, are inserted, is closed by releasable fasteners, e.g. press fasteners.

It is envisaged that the two layers 10, 20 will be supplied, as illustrated, within the cover 30 with the intention that they be used together, the support layer 10 at the bottom providing the necessary stiff support for the softer mattress 20. Both layers of the assembly permit air circulation and fluid drainage. In the case of the mattress 20 this is by permeability, as well as the contoured upper surface, whereas in the case of the support 10 this is by means of the apertures 16 and intersecting grooves 12, 14. The result is a comfortable, hygienic sleeping substrate which also provides adequate support for a child to stand upon for prolonged periods.

The foregoing is to be understood to be illustrative and not limitative of the scope of the invention. Many variations are possible, e.g. in shape and size, and in the materials used as mentioned. In particular it should be noted that even without intersecting grooves, i.e. with just distributed apertures, the support layer may allow sufficient air circulation and drainage.

CLAIMS

1. A mattress assembly comprising a relatively soft mattress layer proper resting upon a relatively stiff lower support layer, the mattress layer consisting of a sheet of air permeable foamed material, and the support layer consisting of a sheet of closed cell, non-porous foamed material having apertures therethrough.
2. A mattress assembly as claimed in claim 1 wherein the support layer has a plurality of grooves traversing one major surface and the apertures therethrough communicate with these grooves.
3. A mattress assembly as claimed in claim 2 wherein the support layers has a plurality of grooves traversing its two opposed major surfaces and the apertures therethrough extend between grooves in the respective major surfaces.
4. A mattress assembly as claimed in claim 2 or 3 wherein the grooves are arranged in intersecting rows and the apertures communicate with or extend between intersection points of said grooves.
5. A mattress assembly as claimed in any preceding claim wherein the support layer is formed of expanded

polyolefin foam.

6. A mattress assembly as claimed in any preceding claim wherein the support layer is formed of expanded polyethylene, polyurethane or polyvinyl chloride foam.

7. A mattress assembly as claimed in any preceding claim wherein the support layer has a density of 20 to 40 Kg/m<sup>3</sup>.

8. A mattress assembly as claimed in any preceding claim wherein the support layer has a density of 25 to 35 Kg/m<sup>3</sup>.

9. A mattress assembly as claimed in any preceding claim wherein the support layer is approximately twice the thickness of the mattress layer.

10. A mattress assembly as claimed in any preceding claim wherein the mattress layer proper and the support layer are located inside a permeable cover.

11. A mattress assembly as claimed in claim 9 wherein the cover is made of open-mesh or open-weave textile fabric.

12. A mattress assembly as claimed in any preceding



claim wherein the mattress layer proper is provided on at least one major surface with an array of peaks and hollows facilitating circulation of air.

13. A mattress support comprising a sheet of closed cell, non-porous foamed material having opposing major surfaces, a plurality of grooves traversing at least one of these major surfaces, and apertures connecting the major surfaces and leading into the grooves.

14. A mattress support as claimed in claim 13 wherein a plurality of intersecting grooves traverse each of the two opposing major surfaces and the apertures extend between aligned intersection points of the grooves on the respective surfaces.

15. A mattress support as claimed in claim 13 or 14 and formed of expanded polyolefin.

16. A mattress support as claimed in claim 13, 14, or 15 and formed of expanded polyethylene, polyurethane, or polyvinyl chloride.

17. A mattress support as claimed in any of claims 13 to 16 and having a density in the range 20 to 40 Kg/m<sup>3</sup>.

18. A mattress support as claimed in any of claims 13

to 17 and having a density in the range 25 to 35 Kg/m<sup>3</sup>.

19. A mattress assembly substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

20. A mattress support substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Amendments to the claims have been filed as follows

1. A mattress assembly comprising a relatively soft mattress layer proper resting upon a relatively stiff lower support layer, the mattress layer consisting of a sheet of air permeable foamed material, and the support layer consisting of a sheet of closed cell, non-porous foamed material having a plurality of grooves traversing each of its two opposed major surfaces and apertures therethrough extending between the grooves in the respective major surfaces.
2. A mattress assembly as claimed in claim 1 wherein the grooves are arranged in intersecting rows and the apertures communicate with or extend between intersection points of said grooves.
3. A mattress assembly as claimed in claim 1 or 2 wherein the support layer is formed of expanded polyolefin foam.
4. A mattress assembly as claimed in claim 2 wherein the support layer is formed of expanded polyethylene, polyurethane or polyvinyl chloride foam.
5. A mattress assembly as claimed in any preceding claim wherein the support layer has a density of 20 to

40 Kg/m<sup>3</sup> .

6. A mattress assembly as claimed in any preceding claim wherein the support layer has a density of 25 to 35 Kg/m<sup>3</sup> .

7. A mattress assembly as claimed in any preceding claim wherein the support layer is approximately twice the thickness of the mattress layer.

8. A mattress assembly as claimed in any preceding claim wherein the mattress layer proper and the support layer are located inside a permeable cover.

9. A mattress assembly as claimed in claim 8 wherein the cover is made of open-mesh or open-weave textile fabric.

10. A mattress assembly as claimed in any preceding claim wherein the mattress layer proper is provided on at least one major surface with an array of peaks and hollows facilitating circulation of air.

11. A mattress support comprising a stiff sheet of closed cell, non-porous foamed material having opposing major surfaces, a plurality of grooves traversing each of these major surfaces, and apertures connecting the

major surfaces and leading into the grooves.

12. A mattress support as claimed in claim 11 wherein a plurality of intersecting grooves traverse each of the two opposing major surfaces and the apertures extend between aligned intersection points of the grooves on the respective surfaces.

13. A mattress support as claimed in claim 11 or 12 and formed of expanded polyolefin.

14. A mattress support as claimed in claim 11, 12 and formed of expanded polyethylene, polyurethane, or polyvinyl chloride.

15. A mattress support as claimed in any of claims 11 to 14 and having a density in the range 20 to 40 Kg/m<sup>3</sup>.

16. A mattress support as claimed in any of claims 11 to 15 and having a density in the range 25 to 35 Kg/m<sup>3</sup>.

17. A mattress assembly substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

18. A mattress support substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.